BEFORE THE PUBLIC SERVICE COMMISSION

OF THE STATE OF DELAWARE

IN THE MATTER OF THE APPLICATION OF DELMARVA POWER & LIGHT COMPANY, EXELON CORORPATION, PEPCO HOLDINGS INC., PURPLE ACQUISITION CORPORATION, EXELON ENERGY DELIVERY COMPANY, LLC AND SPECIAL PURPOSE ENTITY, LLC FOR APPROVALS UNDER THE PROVISIONS OF 26 *Del.* C. §§ 215 AND 1016 (FILED JUNE 18, 2014)	)	PSC DOCKET NO. 14-193

[redacted]

Direct Testimony of Jeremy Firestone

December 12, 2014

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1. Q. Please state your full name and address.

A. My name is Jeremy Mark Firestone. My home address is 130 Winslow Road, Newark, Delaware 19711.

2. Q. Do you also have a business address?

A. Yes, my business address is University of Delaware, 373 ISELab, Newark, Delaware 19716.

3. Q. What is your position at the University of Delaware (UD)?

A. I am a Professor in the College of Earth, Ocean and Environment, School of Marine Science and Policy. I also am the Director of Center for Carbon-free Power Integration.

4. Q. Please summarize your educational background and training.

A. I hold Ph.D. in Public Policy Analysis from the University of North Carolina at Chapel Hill, awarded in 2000, and a Juris Doctorate from the University of Michigan Law School, awarded in 1986. I received a Bachelor of Science in Cellular and Molecular Biology from the University of Michigan in 1980. I was an Assistant Regional Counsel in the US Environmental Protection Agency's regional office, Region I, in Boston from 1986 until 1989 and an Assistant Attorney General in the Michigan Department of Attorney General from 1989 until 1996, where I working on environmental, natural resources and energy. My responsibilities in Michigan were diverse and included being the State's lead lawyer on hydroelectric dam relicensing cases before the Federal Energy Regulatory Commission. As part of that work, I negotiated the first settlement approved by FERC in which a utility was authorized to seek state public utility commission approval to collect dam retirement funding from ratepayers over the license period; the settlement also provided fish enhancement devices and economic damages for fish kills, among other measures. Upon obtaining my Ph.D., I was a Visiting Assistant Professor at the University of North Carolina and then a Senior Lecturer at Duke University School of Law prior to assuming a position as an Assistant Professor at the University of Delaware in 2001. I have since been promoted to Associate Professor and then full Professor. While at UD, I have visited at the University of Maine and have been invited to visit for Spring 2015 by the Ocean University of China to teach a course in Energy Law. My CV is attached as Exhibit 1.

5. Q. Please describe the broad scope of your duties as a Professor at the University of Delaware.

A. My duties can be divided into three broad categories: teaching, research and service to the University, the profession and society.

6. Q. Which courses have you have taught?

A. The courses I have taught at the University of Delaware include Renewable Electricity Law; Offshore Wind Power Science, Engineering and Policy; Climate Change Policy; US Ocean and Coastal Law; and International Ocean and Environmental Law. I also taught Federal Public Land Law at Duke and Ethics in Public Policy Decisionmaking at the University of North Carolina prior to assuming my position at UD.

7. Q. Please describe your research.

A. My primary research focus since 2003 has been on renewable energy, and more specifically wind power and offshore wind power, although I also have undertaken research and/or written on aquaculture, ballast water management, pollution from ships, climate change policy, regional ocean governance, indigenous peoples and marine mammals. I have published in the peer review literature on numerous facets of offshore wind power, including social acceptance, economic valuation of associated visual dis-amenities, pricing, coastal tourism effects, resource assessment, benefit-costs of spatial planning, regulation, the role of public power authorities, and environmental effects. These articles primarily appear in peer review energy, economic, environmental planning, and policy journals; a few appear in law journals. In other research areas I have published in biology and science and technology journals. Presently, I

am collaborating on research projects on ratepayer willingness to pay for offshore wind power, economic effects of offshore wind power development on beach tourism and on perceptions of land-based wind, with a focus on acoustic and visual aspects. I also have small roles on ongoing projects on grid integration and integrated system design. In addition, I am undertaking research on the feasibility of converting oil and gas platforms for use in the extraction of marine geothermal energy in the Gulf of Mexico. I use economic policy analysis, survey research, geographic information systems (GIS), statistics and other quantitative tools, and legal analysis in my research. I have made oral presentations at European Wind Energy Conferences held in Berlin, Frankfurt and Amsterdam, and at numerous conference and universities in the United States. The School of Marine Science and Policy is primarily structured around graduate education, and I work closely with the graduate student who I advise on research. Former graduate students of mine work who focused on energy issues in their graduate studies today work at the Bureau of Ocean Energy Management, US GAO, the Potsdam Institute of Climate Impact Research, and at an energy developer.

8. Q. Please describe your most relevant University service.

A. I was the lead faculty member involved in the development of the UD-Gamesa Wind turbine located adjacent to the University of Delaware's Lewes campus and since the turbine commenced operation in 2010, I have been the lead faculty member involved in the management and operation of the wind turbine. My involvement has included permitting, NEPA compliance, power purchase agreements, O&M agreements, the joint venture agreement, the intellectual property agreement, the research agreement, agreements regarding the sale of renewable energy credits, allocation of net revenues to research, and decisions regarding the

management of First State Marine Wind, LLC. (FSMW), which is the legal entity that owns and operates the wind turbine. I also am one of five individuals that serve on the UD-Gamesa Research Committee. Separately, I was a founder in 2008 and have been Director since 2011 of the Center for Carbon-free Power Integration. CCPI focuses on offshore wind power and grid-integrated vehicles but also touches on land-based wind, airborne wind, marine geothermal and ocean current power. CCPI has faculty in four UD Colleges and brings together expertise in mechanical engineering, electrical engineering, meteorology, marine geology, policy, economics, and marketing. CCPI also offers through the College of Earth, Ocean and Environment a Graduate Certificate in Wind Power Science, Engineering and Policy. In 2013-2014, I served on the University's Working Group to review the Data Center and Cogeneration Plant proposal that was proposed for the University's STAR Campus.

9. Q. Please describe your external service.

A. A few highlights include serving as a workshop organizer for the National Academy of Science for the Marine Board's Offshore Wind Power Workshop, chairing an Offshore Wind Power Conference held in Philadelphia, and reviewing proposals for the National Science Foundation, International Science and Technology Center/US Civilian Research & Development Foundation, Social Science and Humanities Research Council of Canada and the NOAA Sea Grant Small Business Innovation Program. Among the many journals for which I have reviewed manuscripts are *Wind Energy, Applied Energy, Journal of Cleaner Production, Energy Policy, Renewable and Sustainable Energy Reviews, Renewable Energy, Energy Research and Social Science, WIRES Climate Change, Critical Review in Environmental Science and Technology, Risk Analysis, Journal of Environmental Planning and Management,*

Environmental Management, Land Use Policy, Eastern Economic Journal, Marine Resource Economics, Agriculture and Resource Economics Review, BMC Public Health, Journal of Environmental Engineering, Biological Conservation, and Endangered Species Research. I also have reviewed and commented on draft reports prepared by the US Congressional Research Service, the National Academy of Sciences and the National Renewable Energy Lab (NREL). Finally, I am a member of the IUCN Commission on Environmental Law and serve on the Advisory Committee to the Widener Environmental Law Center.

10. Q. Have you appeared in any regulatory proceedings in Delaware related to energy?

A. Yes. I was one of three recognized citizen participants in the Delmarva Power request for proposals for new generation from 2006 until 2008. I also intervened and was a party in the 2006 Integrated Resource Plan (IRP) docket and in the land-based wind power purchase agreement (PPA) docket in 2007. As well, I was a party to the IRP rules docket, where I played an instrumental role, along with DNREC and Delmarva Power, in the development of that portion of the IRP rules that address externalities. More recently, I participated in the DNREC rulemaking related to renewable portfolio standard cost containment.

11. Q. What is the purpose of your testimony today?

A. The purpose of my testimony is to address the direct and indirect economic and policy consequences of approving the joint application for merger between Pepco Holdings, Inc., PHI, and Exelon. A focal point of my testimony is on implications of the commitments included in the joint application for renewable energy, specifically the customer investment fund or CIF and the reliability commitment, the two primary elements on which the joint application is

premised. By its terms, the CIF can be used for any purpose, which could include, for example, support for energy efficiency measures, which is one of the uses analyzed by the Joint Applicants, or renewable energy deployment. Because the claimed reliability benefits of $74.3 million comprise more than 80 percent of total direct benefits that Dr. Tierney calculates, they are a critical component of an application that lacks any specific commitments on renewable energy or energy efficiency. The lack of a commitment here compares dis-favorably to the recent Exelon-Constellation merger agreement, which included a commitment to a wind power and solar power build and $30 million in offshore wind power support, among other items. Prior to testifying, I reviewed the application, the responses to discovery requests including documents such as the Boston Consulting Group's Synergy Handbook and Exelon and PHI documents on reliability, relevant voluntarily produced materials, and materials accessible through the Internet. In addition, I was present during most of the deposition testimony of the Joint Applicants' witnesses. I also reviewed the statutory standards under which the Commission evaluates mergers. Finally, I am familiar with renewable energy policies of the State of Delaware, including the Regional Greenhouse Gas Initiative and the Delaware renewable portfolio standards.

12. Q. Have you reached any overall conclusions.

A. Yes, I have. Exelon engaged Boston Consulting Group, BCG, to undertake a synergy analysis. Mr. David Gee, a BCG partner and a project leader provided testimony regarding the work of BCG. In short, the synergy analysis is based on undecipherable and arbitrary assumptions and misallocates both synergy benefits and merger costs. Exelon also engaged Dr. Susan Tierney, a Senior Advisor in the Analysis Group, to analyze the policy and

economic benefits of the merger. In her analysis, Dr. Tierney relied on vague statements and assertions made by the Joint Applicants' employees and officers in their direct testimony and made untenable assumptions rather than relying on factual material. This led Dr. Tierney to grossly overstate the benefits of the proposed merger. As well, Dr. Tierney failed to properly allocate synergy benefits to the ratepayers, ignored the costs of the merger, mischaracterized some costs as benefits and made numerous incorrect assertions regarding alleged benefits that she did not quantify. Finally, Exelon's polices, position, and practices related to energy policy matters and energy development run counter to public policies of the State of Delaware and the Delaware Public Service Commission and will lead to higher prices to be paid by ratepayers. These positions are hurtful to renewable energy in general, wind power specifically, and place substantial costs and risks on Delaware ratepayers.

13. Q. Can you please elaborate on your review of the BCG analysis.

A. I disagree with a number of assumptions in Synergy Handbook, including the choice of regression equations to calculate slope coefficients that form the basis of the synergy calculations, how it arrived at a midpoint estimate, the decision to only include synergies through year 5 in his analysis, and the inclusion of costs to achieve the merger in his analysis.

14. Q. Please further elaborate on BCG/Mr. Gee's choice of regression equations.

A. In short, BCG undertook two different analyses, but ultimately based its conclusions on what BCG terms an "outside-in analysis," which according to Mr. Gee relies on publically available information, as well as on proprietary models. BGC analyzed the synergy savings over a limited five-year period following the merger. BCG found that scale rather than

improvements in performance will drive most of the synergy savings and estimated that synergy savings would reach [redacted] in the fifth year following the merger, taking the midpoint of [redacted] and a [redacted]. The low end was calculated looking at the savings in the business service centers (e.g., IT, human resources, legal, finance, etc.) in the aggregate, which amounted to [redacted], and adding [redacted] for utility support services, while the high end was based on summing the savings from fifteen separate business service center functions, [redacted] and adding the same [redacted] for utility support services. Mr. Gee indicated that he had no greater or lesser confidence in the two estimates. [redacted]

[redacted]. It is, however, better to look at another metric, known as adjusted R-squared, because that metric corrects for sample size and the number of independent variables, but that is a small problem compared to other issues. [redacted]

[redacted]. These alternative models are likely better than the ones proffered by Mr. Gee, however, we simply do not know. Although the Joint Applicants were requested to produce the underlying data from which the models were generated, and to answer certain other questions regarding what they did produce, so that the results of the models that Mr. Gee did undertake could be verified and analyzed using a series of statistical tests and so that additional models could be run, that data has yet to be produced. [redacted]. That, however, is not a scientific justification for not running alternative models. If alternative, more complicated models generate results that are comparable to simple models, than parsimony might suggest the use of the simple models. If, on the other hand, the results are not comparable, the simple models would be called into question. In sum, the black box is not more complicated models, but rather the failure to analyze those more complicated, albeit, still relatively simple models, and to share the underlying data so that others could test the models and do the analysis themselves.

15. Q. You indicated you take issue with Mr. Gee's midpoint.

A. Yes. Mr. Gee based the [redacted] figure I referenced above on aggregating the values calculated from individual business functions, arriving at a figure of [redacted] In his deposition, Mr. Gee stated that he could have used either 5% or 10%. Given that the synergy analysis forms the basis of the customer investment fund, 10% would have been a more conservative estimate, leading to a figure of [redacted]. Adding the [redacted] in utility support services to that figure results in [redacted]. Further, in light of the

proprietary nature of the slope equations, the problems identified with the regression models, and the inability to independently verify those models and consider alternative models as the underlying data has not be made available, the high end, [redacted] steady-state estimate should be employed.

16. Q. What is the concern with Mr. Gee's choice to end his synergy analysis at year 5?

A. The cut-off at five years is arbitrary and results in substantially fewer synergy savings being passed on to the ratepayers now than if BCG had used ten or fifteen years instead. At his deposition, pages 168-170, Mr. Gee acknowledged that he did not look beyond five years, that although he had referred to [redacted] per year as a "steady state" it was "just the vocabulary we landed on," that it was possible that the synergy benefits would be greater in year six than in year five, and that five years "was the only scope we had," and "so we stopped our analysis at the end of the fifth year." The choice of years an analyst uses is an important consideration that should be scientifically driven rather than based on an arbitrary scope that one is given by a client. If we assume that [redacted] is in fact a steady state and we examine the benefits out to ten years, the total savings in the first ten years would be $522 million plus $650 million or a total $1.172 billion. If we instead use $154 million/year as the steady-state savings, the cumulative savings reach almost $1.4 billion in ten years.

17. Q. Do you have an opinion regarding how the costs to achieve the merger were handled?

A. The BCG analysis offsets the synergy savings with [redacted] million in costs to achieve. The [redacted] figure that BCG landed on was reduced from an earlier figure by [redacted]

[redacted], as BCG determined that executive compensation should instead be a cost allocated to Exelon. That is an appropriate first step, but the remainder of the costs to achieve should not have been allocated to the ratepayers either. All are merger-related costs, and in that regard are no different than the $1 billion+ premium Exelon agreed to pay Pepco Holding Inc. (PHI) shareholders. All of those costs should be treated the same, none should be allocated to the ratepayers and all should be the responsibility of Exelon and its shareholders.

18. Q. How did BCG allocate the net synergy benefits among various entities?

A. Looking at page 70 of the revised Synergy Handbook, BCG allocated a share of the net synergies to each of the existing Exelon utilities, to PHI, and to its non-regulated businesses. PHI allocations were further subdivided by utility including Delmarva Power of Delaware. In total, [redacted] in net synergies was allocated, of which [redacted] was allocated to the regulated businesses and [redacted] to the non-regulated businesses. Of the [redacted] was allocated to Delmarva Power of Delaware. I appreciate that synergy savings that would be gained at other regulated entities such as Commonwealth Edison should benefit those regulated entities' ratepayers. However, non-regulated synergies should not go to enhance Exelon and its shareholders, rather the [redacted] should be allocated solely to the PHI utilities. In contrast, the way in which Exelon has structured the application, for every dollar that is passed on to the ratepayers, Exelon makes a $1.18. While it is true that under Exelon's formulation, the PHI ratepayers gain $100 million, merger approval by regulators, rather than costing Exelon $100 million, actually results in Exelon netting $19 million.

19. Q. So what is the total ratepayer benefit?

A. In its most recent calculation, Exelon/BCG calculated the total Delmarva Power of Delaware ratepayer synergy benefits as being $20 million; as I explain next and summarize in Table 1, using Exelon's own numbers I arrive at $168 million. It does not appear that BCG discounted the costs or the benefits based on a review on the Synergy Handbook. Discounted at three percent, the figure is $145 million; discounted at seven percent it is $125M, and at 10 percent it is $104 million. As is apparent, discounting and the choice of a discount rate has important implications.

Table 1

					Year						Total	DPL share
Benefits	1	2	3	4	5	6	7	8	9	10	($M)	($M)
No discount	58.52	117.04	140.14	147.84	154	154	154	154	154	154	1387.54	167.363964
Discount 3%	58.52	113.5288	131.857726	134.929576	136.335093	132.24504	128.277689	124.429358	120.696477	117.075583	1197.89534	144.663569
Discount 7%	58.52	110.0176	123.827704	122.793539	120.23534	113.021219	106.239946	99.8635495	93.8736165	88.2411995	1036.63571	125.189085
Discount 10%	58.52	105.336	113.5134	107.77536	101.0394	90.93546	81.841914	73.6577226	66.2919503	59.6627353	858.573962	103.685497
Discount rate												
3%	1	0.97	0.9409	0.912673	0.88529281	0.85873403	0.832972	0.80798254	0.78374336	0.76023106		
7%	1	0.94	0.8836	0.830584	0.78074896	0.73390402	0.68986978	0.64847759	0.60956894	0.5729948		
10%	1	0.9	0.81	0.729	0.6561	0.59049	0.531441	0.4782969	0.43046721	0.38742049		

	Net Benefits	Costs	Total (Benefits)
PHI	102	98.5	200.5
Ex	121	0	121
Other U	102	98.5	200.5
Total	325	197	522
Phi share	0.686153846	0.5	0.61590038
DPL Share	0.13453957	0.09803922	0.12076478

I arrive at $168 million by making the following adjustments. First, I use $154 million as the steady-state rate in year five and exclude the [redacted] in costs to achieve for the reasons noted earlier. Thus, the analysis is based on benefits rather than net benefits. Second, I use BCG's Glidepath to calculate annual amounts in years one to five. Third, I include the synergy savings in years six to ten, using $154 million/year (the steady-state). Fourth, I then take the sum, arriving at approximately $1.39 billion. Fifth, when the $121 million is re-allocated from Exelon to PHI only, it results in PHI being allocated 61.6 percent of the total benefits, while

Exelon's existing utilities are allocated the remainder. The Synergy Handbook allocated $20 million in synergy savings to Delmarva Power of Delaware's out of the $102 million it allocated to PHI. Taking BCG's allocation at face value, just under 20 percent (20 out of 102) of the PHI synergies are allocated to Delmarva Power of Delaware so that Delmarva Power of Delaware's share of the total synergy savings of $1.39 billion is 12.1 percent. This is equivalent to $168 million. If Delmarva Power of Delaware's share of the synergy savings is discounted at 3%, its synergy savings allocation is reduced to $145 million, at 7% to $125 million, and at 10% to $104 million. Finally, it is important to remember that the above figures do not include potential greater synergies in years six to ten as compared to year five.

20. Q. Assuming for the sake of argument that the revised estimates accurately reflect the synergy savings, are there other relevant considerations.

A. Yes. The estimates do not incorporate mechanisms to avoid financial and regulatory risks posed by the proposed merger or provide compensation to ratepayers for being exposed to the financial risk of (a) higher prices for renewable energy credits; (b) lower prices for demand response; (c) higher health costs because of less fossil fuel displacement; (d) the failure of the ring fencing to protect ratepayers from nuclear decommissioning or accident costs; or (e) requests from Exelon to buttress an otherwise financially failing nuclear power plant. Because it does not include mechanisms to protect Delaware from Exelon's corporate and shareholder interests that are at odds with the interests of Delaware ratepayers, even if it had a $168 million customer fund, the application would still be lacking.

Indeed, a purely financial settlement does not address a number of policy concerns regarding the proposed merger that arise from Exelon's practices and positions on renewables in general and

wind power specifically. To begin with, Exelon's track record on owning and developing renewable energy generation is not encouraging. It is a laggard when one compares the 2013 percentage of Exelon's generation in MWh per year dedicated to renewable energy generation, 2.17 percent, and that dedicated to solar generation, 0.33 percent, with the minimum percentages required under Delaware's RPS law, which were 10 and 0.6 percent. Exelon also is a laggard on wind power generation nationally, generating wind power at about one-half the national rate. And while Exelon has stated that the vast majority of its overall generation is in PJM, a review of Exelon's website documents that what wind power it does generate is for the most part located outside PJM, so it is doing even less than what first appears on renewables to help Delmarva Power ratepayers.

Exelon's record of renewable energy in general and in PJM specifically is accompanied with a negative public posture toward policies that facilitate renewable energy development. Exelon's posture is manifest in, for example, its opposition to the wind power production tax credit, its opposition to the expansion of renewable portfolio standards in Maryland and modification to the Illinois program, and its opposition to the construction of the Rock Island Clean Energy transmission line that, if built, would be expected to bring wind power into markets that compete with Exelon's existing nuclear generation and to PJM.

The root cause of Exelon's posture toward renewables resides not in the nature of the policies that support renewables, which are not inherently different than those that have long supported fossil fuel or nuclear power, but rather, in the fact that the lion-share of Exelon's generation is nuclear power, and unlike nuclear power plants in France, a global leader in nuclear energy, Exelon's facilities are not load-following. As a result, Exelon's technology is not well adapted to the 21st century of variable, intermittent generation. Because the fuel that powers wind

turbines—the wind—is free, merchant wind power typically is bid into spot markets at $0 or in any event below what Exelon bids in with its nuclear generation. This works for wind power generators as they then receive the market-clearing price. It however does not work so well for Exelon because it lowers the market-clearing price of what nuclear power and other generators would otherwise receive. Further, low prices are now being paid for long-term contracts for wind power, further upsetting old market expectations. Thus, as Scott Brown, Vice-President of Market Initiatives and Analysis for Exelon acknowledged during his deposition, at page 10, Exelon views wind power as an economic threat to its nuclear power plants.

These market dynamics have also led Exelon CEO Christopher Crane to conclude that there is already an "overbuild," an "oversupply," and "excess" wind power. They in turn drive Exelon positions on legislation. Maryland provides a good example. There, according to Exelon Vice President Scott Brown, in his deposition at pages 117, 118 and 122, Exelon opposed a bill seeking to expand the Maryland RPS law in part because if enacted into the law the expansion would have had a negative impact on the profitability of Exelon's generation assets. This instance provides an example of how an integrated company might seek to influence policy differently than a pure wires company, as PHI has admitted that neither it nor Delmarva Power nor Potomac Electric Power Company opposed the increase in Maryland RPS law, and thus, it underscores concerns with the merger. Given that the root of Exelon's policy positions resides in the economic viability of its generation assets, I do not expect Exelon to change its positions as long as it continues to hold on to its nuclear assets.

It also is important to understand that Exelon's positions and practices even when put forward as seeking to advance certain policy positions such as a free market, vary depending on which generation technologies are being advanced. For example, take policy support. Exelon seeks for

nuclear power a mechanism almost identical to a mechanism Exelon has stated is a market and financial risk to it when that mechanism is limited to renewables—a clean energy portfolio standard that would broaden an RPS to include nuclear power and provide Exelon with above-market price support. Likewise, while Exelon opposes even a one-year wind power PTC, it did not oppose a PTC enacted into law in 2005 for nuclear power that runs for a decade and a half nor has it asked for the nuclear PTC to be rescinded. And, while Exelon has stated that wind PTC should not be further extended because the wind PTC was only intended to be temporary, it has not advocated the dismantling of the Price Anderson Act's insurance provisions that have for decades capped nuclear power liability and set up a non-market, social insurance system that does not differentiate among nuclear power plants based on their relative risk (e.g., age, location, design), despite the fact those insurance provisions were intended to be temporary. Thus, over and above any synergy savings to pass on to the ratepayers, there remains Exelon's aversion to Delaware's renewable energy policy goals; the risk that its positions will lead to greater prices for RECs; the risk that those greater REC prices will cause state law REC rate caps to be exceeded, leading to a moratorium of Delaware's renewable energy requirements; the risk of less renewables being built than otherwise, contributing to the risk of sea level rise to residents and businesses of low lying states like Delaware; the health risk its positions pose to Delaware residents due to less fossil fuel being displaced; and the risks its nuclear fleet pose to Delmarva ratepayers financial well-being. I will provide further discussion in the context of my review of Dr. Tierney's benefits analysis.

21. Q. Is the difference between the BCG calculation of $20 million and the revised $168 million figure relevant for renewable energy, energy efficiency, and the like?

A. Yes. The $20 million—actually, at the time of application, $17 million, formed the basis of what the Joint Applicants refer to as the customer investment fund. That money could be used in many ways, including equal lump sum payments, payments to low income ratepayers only, for energy efficiency or to facilitate the purchase of above-market priced renewable energy such as offshore wind power, or some combination of the above. A CIF of $104-168 million opens up many more opportunities for renewable energy and energy efficiency as compared to the much more constrained, $17 million. One can see this in the much more generous Constellation settlement, where Exelon agreed to fund $113 million in customer bill credits, an additional $113.5 million for additional customer support for items such as energy efficiency and low-income energy assistance, $30 million towards offshore wind power, an investment of approximately $680 million to fund 285MW to 300MW of new generation, including wind power and solar power, and $100 million out of a total investment of $350 million for a new building.

22. Q. You indicated that you also had an opportunity to review the analysis of Dr. Tierney?

A. Yes I did. Dr. Tierney conducted a benefit analysis primarily focused on two items: the customer investment fund and reliability. Dr. Tierney also noted many items that she claimed were un-quantified benefits such as "maintaining" a local presence, "honoring" existing collective bargaining contracts and other labor-related actions for at least the first two years, "retaining" low-income assistance programs, and not seeking recovery of merger-related costs. Each of these is however not a benefit over the status quo. To the extent any of these items is mandated by law, it also would not be a benefit.

23. Q. What about costs?

A. In a cost-benefit analysis, it is necessary to consider both sides of the ledger—the costs and the benefits. In her analysis, however, Dr. Tierney only focused on the benefits. For example, she did not include any potential for job losses in her analysis as a cost of the merger. The one cost Dr. Tierney did discuss—the potential for Delmarva ratepayers to bear the costs of, for example, an accident at one of Exelon's nuclear power reactors—she considered a benefit. She did so because she only focused on ring-fencing and compared Exelon's offer to include a ring fence to protect PHI and Delmarva from liability resulting from other aspects of Exelon's business to no ring fence. But that is not the correct comparison. The comparison that Dr. Tierney should have made is between, for example, exposure to costs resulting from a nuclear accident at an Exelon facility when PHI and Exelon are separate entities (the status quo, and, hence zero) to exposure from a nuclear accident or due to decommissioning costs while PHI/Delmarva is an Exelon subsidiary that is nominally protected by ring fencing. A ring fence is not a 100 percent guarantee and thus financial exposure remains. As such, the merger presents a cost to ratepayers that should it be approved would be equivalent to the amount of money that would be required to ensure against liability should the ring fence not be protective. Another cost that Dr. Tierney did not consider is the risk that Delmarva ratepayers will be asked to pay above market prices for nuclear power to support a program such as a clean energy portfolio standard under which nuclear energy could qualify in addition to renewable energy. This is germane because Exelon is asking regulators to approve just such a scheme in both New York and Illinois. Dr. Tierney also did not consider the cost that ratepayers might have to bear from moving from a wires company to an integrated company that includes generation. Given its fiduciary obligation to its shareholders, Exelon's actions to protect and enhance its unregulated

business interests will at times be at odds with the best interests of Delmarva ratepayers. As noted, Exelon opposes the production tax credit for wind power. That opposition recently found common cause with an energy corporation that primarily owns coal generation assets. Indeed, Exelon CEO Christopher Crane penned a joint editorial with the CEOs of two other large generation companies, including the CEO of First Energy, which fuels the majority of its generation with coal, that was published by Forbes on October 23, 2014, and is available online at http://www.forbes.com/sites/realspin/2014/10/23/the-ptc-is-no-longer-needed-to-support-the-wind-industry/print/. There, the three CEO's made clear their opposition to the production tax credit in part because they consider coal plants to be "critical" and "increasingly vulnerable" due to the "artificial" price suppression effects of the production tax credit while failing to mention the artificial price suppression effects of the environmental, health and climate externalities of coal, as documented in 2010 by the National Academy of Sciences in the *Hidden Costs of Energy* and Epstein, et al., *Full Cost Accounting for the Life Cycle of Coal*, published in 2011 in volume 1219, pages 73-98, of the Annals of the New York Academy of Sciences.

Exelon also has opposed transmission from the Midwestern part of the country into PJM, which if built has the potential to bring vast quantities of wind power into PJM. If the merger is approved, Exelon will have greater market power in transmission and an even larger voice in state, regional and national policies. If less wind power is built in or transmitted into PJM because of Exelon's policies, practices, advocacy and the like, Delmarva Power ratepayers will have to pay more for renewable energy credits; this is a simple case of demand, which is mostly fixed in the short-term based on various state RPS laws, and supply, which is variable. As well, if less wind power is built, the market clearing price in a given hour will increase, as wind power would otherwise bid in at $0, raising the price that Delmarva Power ratepayers must pay for

energy regardless of its source, including coal, natural gas, and Exelon's nuclear power. If wind power developers are not able to count on the 2.3 cents/kWh production tax credit for each kWh generated during the first ten years after project commissioning, that difference will have to be made up somewhere, and while a portion may come from lower wind power developer profits, those developers can be expected to seek higher prices for RECs. In addition to increasing the out-of-pocket money that ratepayers would have to contribute, higher prices for RECs also may mean less renewable energy for Delaware. This results because it will be more difficult to expand the current REC minimum in the face of greater prices; because the existing law only sets minimums; and because the existing law has cost containment provisions, which if brought into play will freeze REC obligations.

In addition, modeling studies document that renewable energy in PJM displaces primarily coal and natural gas. The precise ratio will depend on various factors such as where the new renewable energy generation is built, the extent of build out, and relative prices of coal and natural gas, but based on studies by PJM in 2009 (Potential Effects of Proposed Climate Policies on PJM's Energy Market; 60 percent coal displacement; 40 percent from natural gas and oil) and GE Energy Consulting for PJM in 2014 (Executive Summary, PJM Renewable Integration Study; 36 percent coal; 39 percent natural gas; the remainder decreased imports/increased exports), most of the displaced fuel is from fossil fuel sources and the ratio of coal to natural gas is about 1:1. It is reasonable to assume that if additional renewable generation capacity is built, some of the displaced fossil fuel generation will be upwind from Delaware. Delaware citizens incur health costs due to air pollution and citizens and businesses incur costs to comply with clean air standards as a result of emissions from existing upwind fossil fuel generation. In addition, Delaware is among the states most susceptible to sea level rise, with potentially large

economic, social, environmental and cultural costs. Each of these is a real cost. In her Direct Testimony at page 9, Dr. Tierney specifically called out and quoted Governor Jack Markell's 2013 and 2014 State of the State Addresses as putting forward important markers that shaped her analysis. The statements she referred to included the Governor declaring we "need to expand our energy portfolio, reduce costs and improve air quality" and that the "ability to .... access cleaner, cheaper, and more reliable energy, is essential to every industry in our state." Costs associated with those markers, however, did not appear in Dr. Tierney's analysis. Nor did the fact that the GE/PJM report concludes that under every renewable energy scenario analyzed, lower fuel, variable O&M and lower locational marginal prices resulted, thus further underscoring the conflict between Exelon's actions to benefit its generation business and interests of Delmarva ratepayers. This conflict also arises in regard to demand response and energy efficiency measures and the compensation that such energy saving actions receive in the capacity market. Even if Dr. Tierney would not have been able to quantify any or all of these costs, she could have mentioned them, just as she mentioned numerous un-quantified items that she deemed to be benefits.

24. Q. Do you have any other general thoughts about the analysis undertaken by Dr. Tierney?

A. Yes. Dr. Tierney examined the direct and indirect benefits of a flow of money into a customer investment fund and from reliability benefits. The analysis was incomplete in that it did not include any sensitivity analysis. In a sensitivity analysis, an analyst tests how sensitive the results are to the assumptions in the model. For example, in her analysis, Dr. Tierney chose a low discount rate of three percent. While a three

percent discount rate is not necessarily inappropriate, in some situations a seven percent discount rate is used; in others a ten percent rate; when, for example, one is considering future commitments that will or will not be met, such as a future reliability commitment, one should give consideration to using a risk adjusted rate; and finally, when intergenerational questions such as climate change arise with long time horizons, a very low discount rate might be used. For example, in an analysis I undertook that was led by my graduate student Kateryna Samoteskul of the costs and benefits of having commercial ships transit further offshore to allow for the construction of nearer shore offshore wind power, we initially used a 3.5 percent social discount rate, but in a sensitivity analysis, we increased the discount rate to 10 percent, along with modifying other assumptions. Sensitivity analysis helps the analyst, decision-makers, stakeholders and the public better understand the uncertainty around estimates. Here, use of a higher discount rate in addition to Dr. Tierney's chosen three percent rate would have been informative. A higher rate would have resulted in fewer benefits and thus the merger would have appeared as being less beneficial to the ratepayers.

25. Q. Turning then to Dr. Tierney's Customer Investment Fund analysis, do you have an opinion?

A. Dr. Tierney undervalued the customer investment fund payment, using a figure of $17 million rather than $20 million. As I noted earlier, that $20 million figure is itself inappropriate. From my review of Dr. Tierney's deposition testimony, Dr. Tierney interpreted her task as being an exceedingly narrow one in which she took at face value and relied on numbers given to her by Exelon and reviewed the direct testimony of some

of the Joint Applicant's officers, rather than examining underlying documents and reports, as I have. This led her to make several errors, including failing to independently determine the appropriateness from an analysis' point of view of, for example, allocating synergy savings to Exelon and costs to achieve to Delmarva ratepayers. I have not reviewed the IMPLAN model in detail and thus I do not take issue with Dr. Tierney's analysis of the relative merits of allocating the customer investment fund in a lump sum versus to energy efficiency, although the results in a general sense appear consistent with intuition.

26. Q. Do you have an opinion regarding the Dr. Tierney's reliability analysis?

A. Yes, I do. Dr. Tierney's reliability analysis is fundamentally flawed. She made inappropriate and arbitrary assumptions rather than those based on documents and facts. The benefits she calculates thus do not exist. When the appropriate reliability metrics and costs are used in the reliability analysis, the costs of the reliability program proposed by Exelon are greater than its benefits. In other words, the reliability commitments should not be undertaken as they do more harm to Delmarva ratepayers than good.

27. Q. Please elaborate.

A. Dr. Tierney made two fundamental errors in her reliability analysis. First, Dr. Tierney failed to account for the cost of the reliability program, which by the Joint Applicants own reckoning is $4 million per year. Second, rather than comparing what the $4 million would buy—that is comparing the level of reliability that Exelon will achieve

with an additional $4 million/year to that which PHI would achieve if the merger does not go through and it does not expend additional funds—Dr. Tierney assumed a SAIDI baseline of 159, which she derived from calculating the historic Delmarva Power average during 2011, 2012 and 2013, and used that as her basis for comparison to Exelon's proposal to achieve a SAIDI of 122 on average for the years 2018 to 2020. During the 2011 to 2013 period, the SAIDI were drastically decreasing so use of a three year average only served to further bias Dr. Tierney's analysis to the benefit of Exelon, resulting in Dr. Tierney's estimation of benefits totaling $74.3 million.

In Table 2, I have recalculated the reliability "benefits" using the proper metrics. As shown, the benefits are substantially negative. Let me explain briefly how I constructed Table 2, and provide a few caveats.

First, I simply took as a given, Dr. Tierney's use of a 3% discount rate. Second, for the purpose of this analysis, I also took as a given the annual benefits as calculated by Dr. Tierney from Dr. Tierney's IMPLAN work plan and exhibits. [redacted]. Fourth, I used the annual assumed baseline and Exelon SAIDI numbers from page 47 of Exelon and PHI's Regulatory Strategy Reliability Update, Executive update, dated May 19, 2014. Fifth, I assumed that SAIDI improvements were linear in benefits leading to 122 (that is, a SAIDI improvement from 140 to 122 results in twice the benefits of a SAIDI improvement from 131 to 122). Sixth, I multiplied benefits by fractional difference in confidence level. [redacted]

[redacted]. I based these confidence levels on the aforementioned document, page 16, and on a similar documented authored by Exelon alone, entitled, Regulatory Strategy Package – Reliability Improvement All Jurisdictions, and dated May 27, 2014, at page 5. Seventh, using that same source material I used a 100% confidence level that Exelon could achieve a 122 baseline in 2020. This assumption is generous given the financial penalty should Exelon fail to achieve this SAIDI level is only $1.5M, it is to be paid in future dollars, presumably 2021 dollars or beyond—it is uncertain when such a payment would come due—and is dwarfed both by the cost of the merger and Exelon's quarterly revenues, and thus may not be sufficient to induce compliance. Eighth, I used the $4 million/year in annual O&M costs that Exelon would reallocate to meet a SAIDI value of 122 with estimated 100% confidence, again taken from the same documents. The $4million/year is appropriately a cost, for if Exelon can re-allocate $4 million/year, it could instead, simply decrease the overall O&M budget by $4 million/year and not undertake the program, so the real cost of the program is in fact $4 million/year. Like benefits, I discounted costs using Dr. Tierney's 3% discount rate.

The discounted benefits minus discounted costs from 2015-2016 are -$13.4 million. However, because Dr. Tierney in her testimony relied on the financial penalty as the basis for the commitment, and because the commitment is only for 2018-2020, a conservative analysis counts only benefits in 2018-2020, while costs run from 2015-2020. This results in costs exceeding benefits in an amount of -$17.6 million. In either event, the upshot is that the program should not be undertaken and the reliability benefits should be valued at zero.

[redacted]

28. Q. Are there any economy of scale benefits from the merger related to renewables?

A. A potential benefit that I can think of is procurement of offshore wind power. The industry has been hampered to date in part from a state-by-state approach to offshore wind power. Offshore wind power requires large capital costs and a large mobilization. Economies of scale in such an industry can be very important, and bring benefits to ratepayers in terms of lower prices, although in any event in the near-term price will be above market. A commitment to a large build also can be transformative for the industry as far as domestic manufacturing, supply chain and port development, and can serve to bring down the price per MWh. If the merger is approved, Exelon distribution entities will operate in D.C., Maryland, Delaware, Greater Philadelphia and part of New Jersey and thus, if Exelon was so inclined, subject to regulatory approvals, it could move forward with a comprehensive power purchase agreement. For example, if Delmarva Power of Delaware were to purchase energy from 200MW of offshore

wind power as part of the Exelon consortium it would translate into a substantial offshore wind buy on the order of 2GW. Any such potential however takes a willing Exelon, which does not appear to be the case given that Exelon Vice-President Scott Brown testified at pages 75 and 76 of his deposition transcript that Exelon opposed both a production tax credit and an investment tax credit for offshore wind power, feeling it to be a mature technology.

29. Q. Will you please summarize your conclusions.

A. Based on my review and analysis of the application, including the regulatory commitments, responses to discovery requests, documents produced by the Joint Applicants, and deposition transcripts, I conclude that the commitments in the application will provide meager benefits that are much less than claimed to Delmarva Power ratepayers and to the State of Delaware. Further, based on my review of Exelon's policies, practices and positions related to t he generation, supply and transmission of renewable energy resources, renewable portfolio standards, energy efficiency and the like, the proposed merger if consummated will impose significant financial and policy risks on Delmarva Power ratepayers and the State of Delaware.

30. Q. Does this complete your testimony?

A. Yes.

BEFORE THE PUBLIC SERVICE COMMISSION

OF THE STATE OF DELAWARE

IN THE MATTER OF THE APPLICATION OF DELMARVA POWER & LIGHT COMPANY, EXELON CORORPATION, PEPCO HOLDINGS INC., PURPLE ACQUISITION CORPORATION, EXELON ENERGY DELIVERY COMPANY, LLC AND SPECIAL PURPOSE ENTITY, LLC FOR APPROVALS UNDER THE PROVISIONS OF 26 *Del.* C. §§ 215 AND 1016 (FILED JUNE 18, 2014)	))))))))))	PSC DOCKET NO. 14-193

CERTIFICATE OF SERVICE

I hereby certify that on December 22, 2014, that on behalf of Jeremy Firestone, Pro Se, I filed the Redact Version of the Direct Testimony of Jeremy Firestone with Delafile and served a copy of the same on all persons on the email service list by email attachment.

Respectfully submitted,

Jeremy Firestone
22 December 2014